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REPORT TO THE IGBC ON THE AVAILABILITY OF FOODS FOR GRIZZLY BEARS IN THE YELLOWSTONE ECOSYSTEM

December 1986

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BACKGROUND

Considerable controversy surrounds the grizzly bear food situation in the Yellowstone ecosystem. For many years significant amounts of garbage was made available to the grizzly and black bears in the ecosystem through the operation of open pit garbage dumps by the National Park Service. Although the purpose of these dumps was convenient disposal of the garbage produced by park visitors, the dumps probably indirectly resulted in a significant change in the feeding ecology, behavior, and movement patterns of the area's grizzly and black bears. Aspects of the grizzly bear population that fed on garbage in Yellowstone has been documented (Craighead and Craighead 1972, Craighead et al 1969, Craighead et al. 1974).

With the close of the garbage dumps in the early 1970's, the grizzly population underwent a reduction as the animals that were dependent on the dumps increased their use of the campgrounds and developed areas of the ecosystem and were destroyed (see Knight and Eberhardt 1985). Since 1970 there has been no major garbage food source for grizzly bears in the Yellowstone ecosystem. Several small dump areas such as Cooke City, Montana, West Yellowstone, Montana, and Gardiner, Montana have undergone modifications to secure garbage and human foods from bears. Backcountry users have been directed to maintain clean camps and have been given specific direction on how to secure foods from bears (see Interagency Grizzly Bear Guidelines 1986). Overall, there has been a dramatic reduction since the early 1970's in the availability of garbage and human foods to bears in the Yellowstone Ecosystem. Although efforts are still underway to convince private individuals to secure their personal garbage at homes and businesses in these towns, progress is still needed in this regard.

The habitat occupied by grizzly bears in the Yellowstone ecosystem is approximately 8300 sq mi. Of this area, 99% is in federal jurisdiction as national parks or national forests. One percent of the occupied habitat is in private ownership, yet this one percent is responsible for the majority of the human-bear conflicts. Most recently, in 1986, 68% of human-bear conflicts resulting in the capture of a bear occurred in the private lands in West Yellowstone, Gardiner, and Cooke City, Montana. The basic reason for conflicts in these areas was the availability of unsecured garbage at private residences and businesses, and in the case of Gardiner, the availability of domestic fruit trees.

Grizzly bears involved in bear-human conflicts are often animals that have a previous history of use of human foods. It appears that animals that receive a food reward in a human use area will continue to seek such foods although the frequency and intensity of the

conflict appears to vary with the individual bear. Relocations of such animals often provide only a short term solution as they often return to the initial conflict site and again seek human foods.

Present management efforts in the Yellowstone ecosystem are directed at minimizing bear-human conflicts by eliminating the attractive garbage and human food sources in the ecosystem. The elimination of garbage and human foods from bears is recognized as the major tool that can be used to minimize bear-human conflicts in all areas where the grizzly exists. It is also recognized that bear-human conflicts will never be totally eliminated due to the interaction of more than 200 grizzly bears and more than 2 million visitors each year in the Yellowstone ecosystem. In addition, despite gains made in educating the public, progress remains to be made on reducing the availability of garbage and human foods on the private lands in the ecosystem. It is likely that further gains in reducing food availability on private lands will reduce the current level of bear-human conflict in the ecosystem.

The fact that bear-human conflicts do continue in the Yellowstone ecosystem has prompted some concern that perhaps the bears do not have sufficient natural foods in the ecosystem and the conflicts are evidence of this lack of natural foods. The end result of such an argument is that the Yellowstone ecosystem cannot support the present grizzly bear population and that humans must supply foods to the population if it is to survive.

The purpose of this review is to attempt to document the existing knowledge about the grizzly bear foods in the Yellowsone ecosystem in order to attempt to determine if there are presently sufficient natural foods available to support the existing grizzly bear population.

FORMAT

This report is organized to present the existing data on the biology and ecology of the grizzly bear in the Yellowstone ecosystem in an outline format. This report is not intended to be an exhaustive detailing or interpretation of the large amounts of data available. For detailed accounts of this information the reader is referred to Knight et al. (1975, 1976, 1977, 1978, 1980, 1981, 1982, 1983, 1984, 1986) and Knight and Eberhardt (1984, 1985). This report is not a publication. It is intended as a report to the Interagency Grizzly Bear Committee to assist in management decisions regarding the conservation and preservation of the grizzly bear in the United States. The data presented herein were developed as part of the Interagency Grizzly Bear Study. These data have been and will be

presented formally as published material in refereed journals. For proper citation of the data, these publications should be referenced.

This report presents the existing data by section and is concluded with a summary and a set of recommendations. The organization reflects the major areas relating to grizzly bear biology, feeding ecology and estimation of the availability of important grizzly bear foods.

INTERPRETING RESULTS OF GRIZZLY BEAR SCAT ANALYSIS

Information concerning food habits of bears is derived primarily from analysis of scats. However, interpretation of scat analysis is complicated by several problems: (1) the effects of different digestibilities on representation of diet items in scats, (2) the need to convert volumetric results to the currency probably most meaningful to bears, i.e., net digested energy, and (3) the different ingestion rates associated with the different months, that complicate assessing the contribution of a diet item to total yearly diet. The IGBST has attempted to resolve these three problems in interpretation of scat analysis results, as follows.

Ingested diet differs from diet indicated by scat analysis because diet items are differentially digested by bears. Protein and thus meat, is much more digestible than complex carbohydrates. To account for differences in dry matter digestibility between diet items, the proportionate contribution of each item to scat composition was weighted by an estimate of digestibility: close to 80% for berries and meat and closer to 10% for foliferous vegetation. The result of this weighting process was an estimate of ingested diet. This new value was rescaled so that the weighted contributions of diet items summed to 100%, or 1.00.

An estimate of the contribution of diet items to net digested energy resulted from making further adjustments. As in translation of what was found in scats to an estimate of what was ingested, a weighting factor was applied to proportionate contribution of diet items to ingested diet and the results rescaled to add to 1.00. The weighting factor was an index of energetic efficiency associated with use of a diet item. This index resulted, in part, from comparing characteristic digested energy available in each bite with a rank estimate of energy required to extract the bite; digested energy available from diet items was derived from analysis of energy contents and digestibilities.

The resulting value was an index of net digested energy available from use of each diet item. This value was further modified by addition of a value indicating density of a food at a characteristic

feedsite.

Bears experience a yearly cycle in physiological states related to the demands of hibernation and availability of high quality foods. This is reflected by different physiological parameters and also, apparently, by demand for food. Defecation rates (scats/day) were summarized by month for captive brown bears in Europe that were fed ample diets of constant composition. These rates varied substantially between month and corresponded well with demand for food associated with the breeding period (estrus in females) and the period of intensive feeding prior to denning (hyperphaegia). Defecation rates also corresponded well with changes in behavior and foraging strategies noted for grizzly bears and with mean monthly weights of captured adult males in the Yellowstone area. These defecation rates are therefore logically interpreted as reflecting demand for food that is, in turn, determined by the yearly cycle of physiological states. Further, this cycle of demand very likely holds true for most bears in the Yellowstone area.

Because demand and ingestion rate varies between months, foods available and ingested each month will contribute differentially to total yearly diet. May and June would contribute much less on a volumetric basis than would August and September to total yearly diet. The late summer-early fall diet would thus be more important to overall condition of bears than would the early summer diet.

To determine contribution of each diet item to net digested energy for the entire year, monthly diet item contribution was weighted by a coefficient that directly reflected demand estimated for that month. Summation of adjusted values across months yielded relative contribution of a diet item to total net digested energy for the year. This value was rescaled so that all contributions summed to 1.00.

GRIZZLY BEAR BIOLOGY

WEIGHT

1. Both male and female weights were greater during the period 1959-1970 than 1974-1985 (Fig. 1), however the possible effect of mean ages of the sample in the two populations has not been assessed.

2. Mean adult female weight is a function of average habitat productivity score for the previous fall and the spring and summer of the present year (Fig. 2).

3. Seasonal weight changes of males vary in accordance with

injestion rate (Fig. 3).

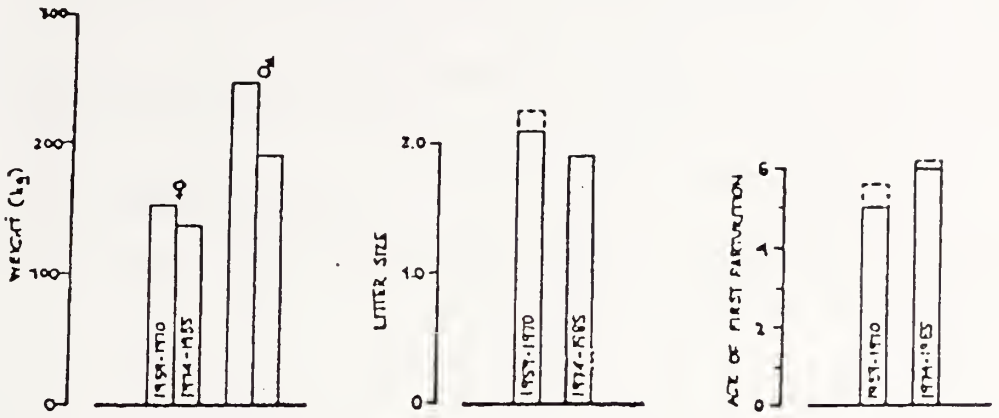


Figure 1. Comparison of body weight, mean litter size, and mean age at first reproduction between the 1959-70 period when the garbage dumps were open and the 1974-85 period when garbage was not available to bears.

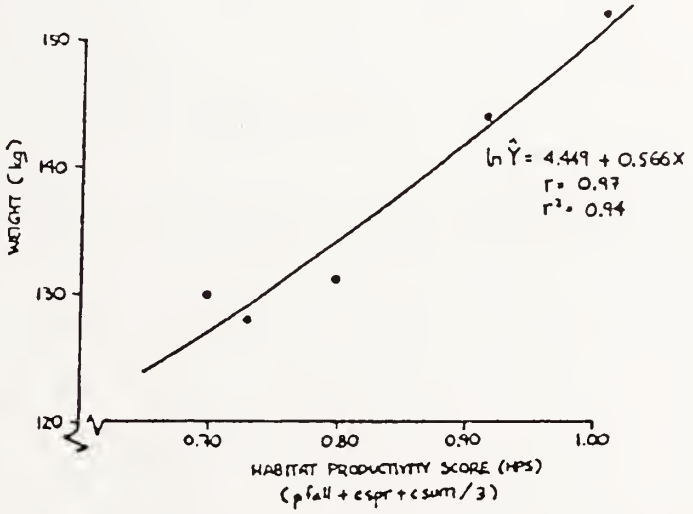


Figure 2. Annual variation in adult female weight relative to averaged habitat productivity scores of the previous autumn and the following spring and summer.

REPRODUCTION

1. Mean litter size was 2.24 cubs/female (N = 68) 1959-1970 (Fig. 1).

2. Mean litter size was 1.86 cubs/female (N = 160) 1973-1985 (Fig. 1).

3. Mean age at first reproduction for females was 5.5 years 1959-1970 (Fig. 1).

4. Mean age at first reproduction for females was 6.13 years 1974-1986 (Fig. 1).

5. Litter size 1974-1985 varies by age of the female (Fig. 4).

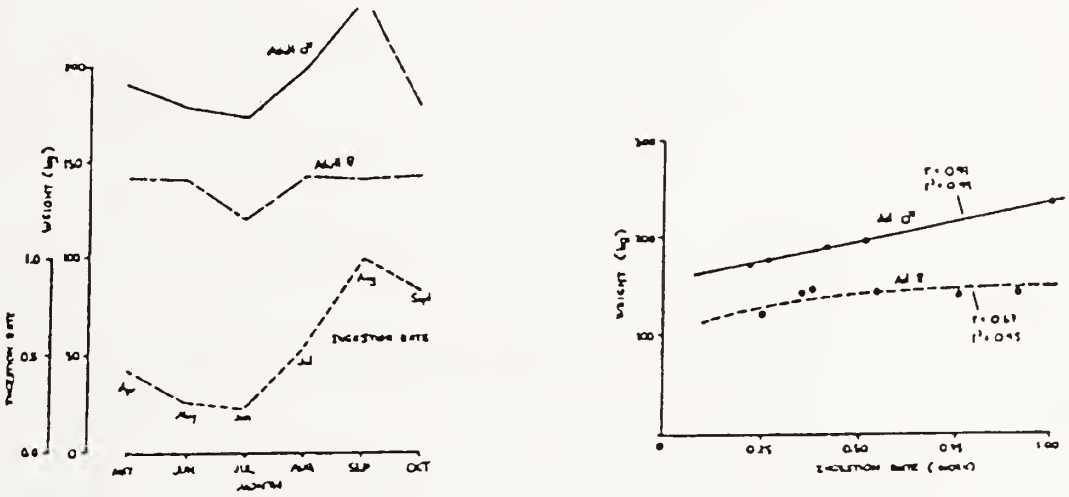


Figure 3. Seasonal weight changes of adult males and females relative to ingestion rate.

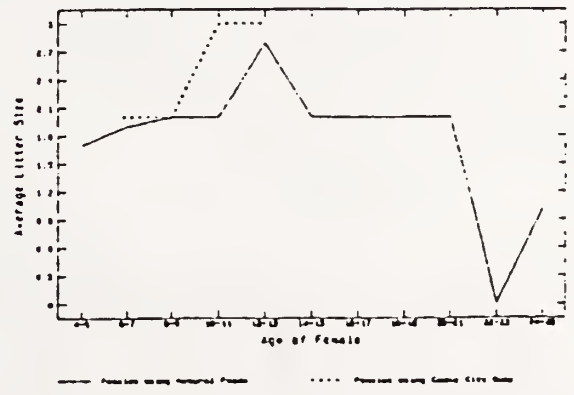


Figure 4. Average litter size by age 1975-85 YGBE. Note that females using dump foods contributed no surviving offspring as of 1986 due to habituation and eventual removal or death.

FEEDING ECOLOGY 1974-1985

1. Injestion rate varies throughout the year in response to reproductive criteria and metabolic demand related to hibernation (Fig. 5). The period from mid-July to mid-September is characterized by the term hyperphagia (over-eating) due to the need to deposit fat reserves prior to den entry.

2. Hyperphagia is directly related to weight gain (Figs. 3 and 5).

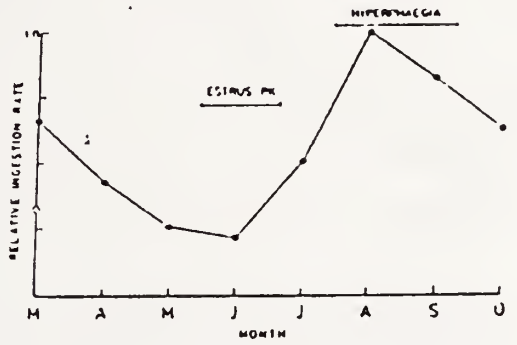


Figure 5. Relative ingestion rate from den emergence to den entry showing period of hyperphagia.

3. Food habits vary seasonally (Fig. 6).

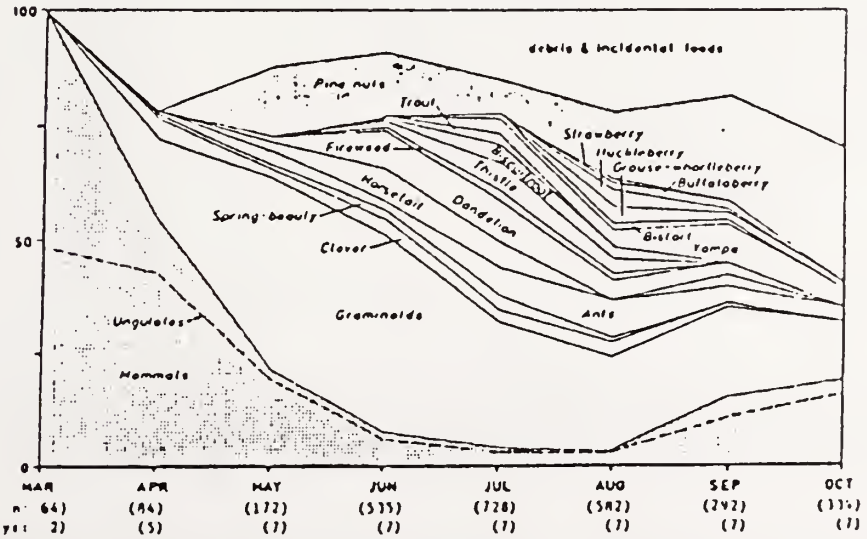


Figure 6. Overall food habits by season for Yellowstone ecosystem grizzly bears. N = number of scats/month in collection. Yr = number of years of collection.

4. Major food items are ungulates, foliage, and whitebark pine nuts (Fig. 7) and these items contribute the major amounts to net digested energy in spring, summer, and fall respectively (Fig. 8).

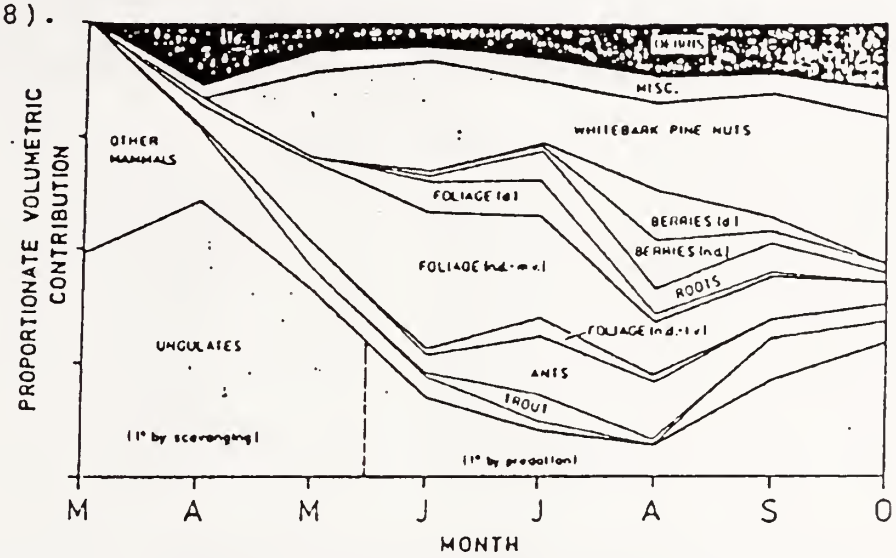


Figure 7. Proportionate volumetric contribution of food items by season for Yellowstone ecosystem grizzly bears.

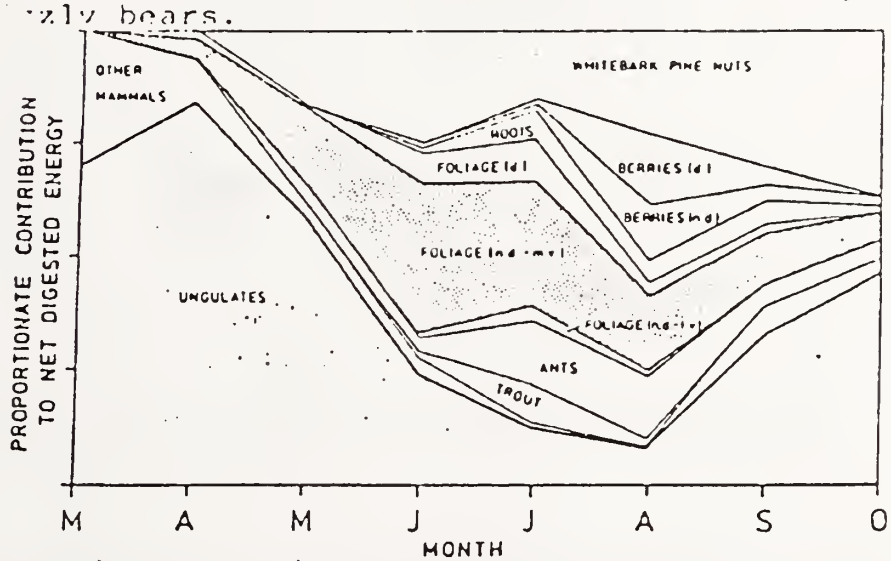


Figure 8. Proportionate contribution to net digested energy of major food items by season for Yellowstone ecosystem grizzly bears.

5. Ungulates make up the highest proportion of the diet followed by whitebark pine nuts and foliage (Table 1).

6. Ungulates make the greatest contribution to diet protein and

ants are a protein source in mid-summer (Fig 9).

Table 1. The relative contribution of major diet items to annual net digested energy for Yellowstone ecosystem grizzly bears.

	CONTRIBUTION	
	RELATIVE	PROP.
UNGULATES	1.00	.302
PINE NUTS	.75	.228
FOLIAGE	.69	.209
BERRIES	.36	.108
ANTS	.18	.053
ROOTS	.14	.043
RODENTS	.12	.038
FISH	.06	.018

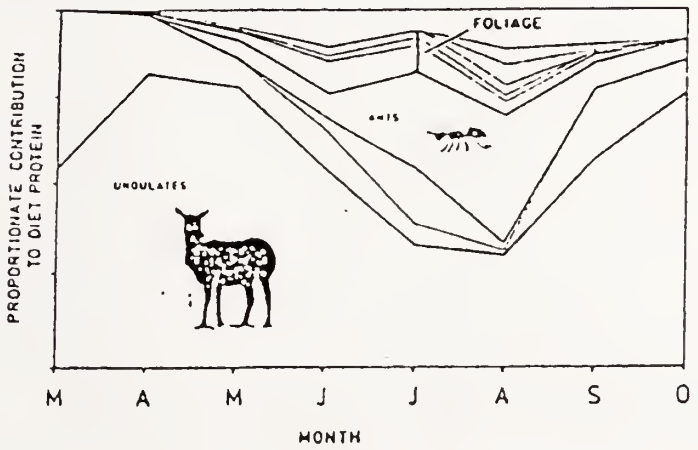


Figure 9. Proportionate seasonal contribution to diet protein of major food items for Yellowstone ecosystem grizzly bears.

7. Ungulates and whitebark pine nuts are the major sources of diet fat in spring and summer/fall respectively (Fig. 10). Ants also a source of fat in summer especially in dry years.

8. Ungulate use is inversely correlated with whitebark pine nut use (Fig. 11). This relationship is apparently driven by variations in whitebark pine nut production. When whitebark pine nuts are available, the bears will use them in spring and fall in place of elk. Thus, whitebark pine nuts in the bear diet are represented in direct proportion to their availability.

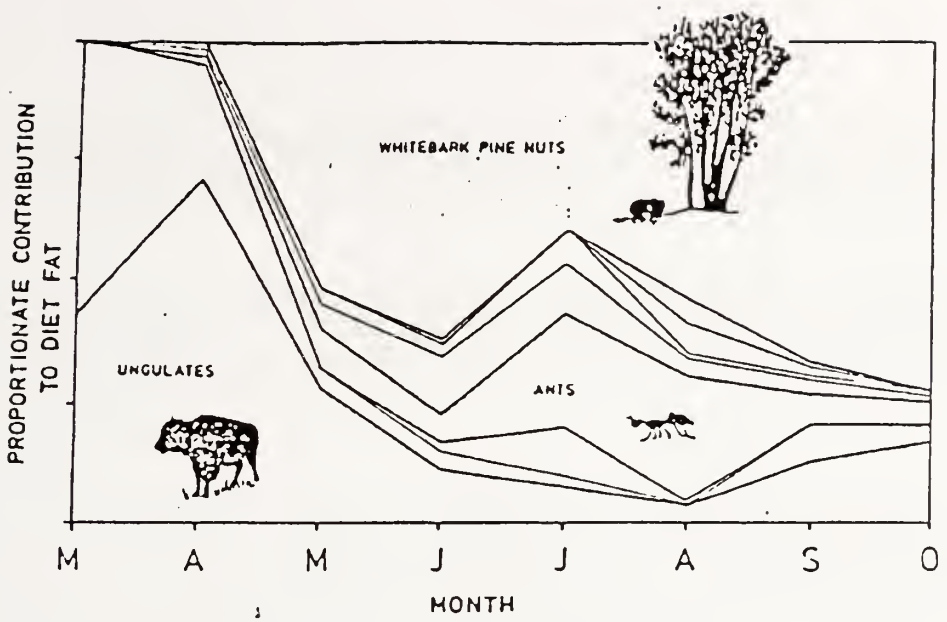


Figure 10. Proportionate seasonal contribution of major food items to diet fat for Yellowstone ecosystem grizzly bears.

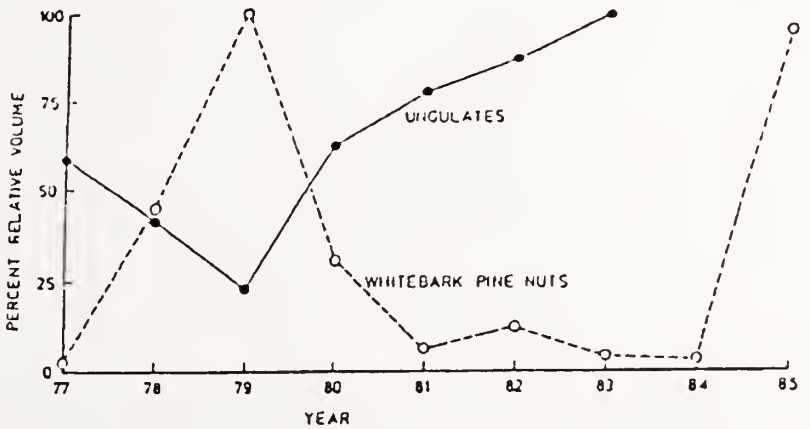


Figure 11. Use of white bark pine nuts and ungulates as both carrion and as a result of predation for Yellowstone ecosystem grizzly bears.

9. Whitebark pine nut production is variable over a 3 to 5 year period.

10. Bears seek high quality foods in spring and fall (Fig. 8). High quality foods are those that are high in fats and/or protein such as ungulates or whitebark pine nuts.

11. Predation by bears on elk has been known in the Yellowstone ecosystem even when the dumps were open. Increasing reports of

predation may be due to increasing elk numbers and therefore predation opportunity, increasing numbers of grizzly bears, increasing predatory habits by bears, or a combination of these factors.

12. Food habits are highly variable between years, especially in May, June, and August. During years when primary foods such as whitebark pine nuts are unavailable, secondary foods, such as roots, become more important.

AVAILABLE FOODS

1. Garbage was most abundant in the late 1960's when amounts averaged up to 40,000 pounds of garbage per day in the peak park visitor season of July and August (Fig. 12). Garbage became unavailable in the park in 1970 and unavailable in areas outside the park by the mid 1970's.

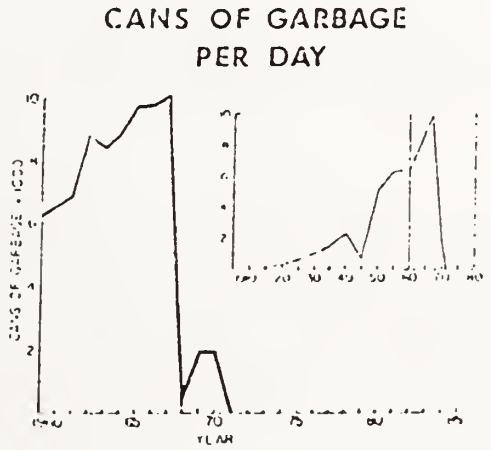


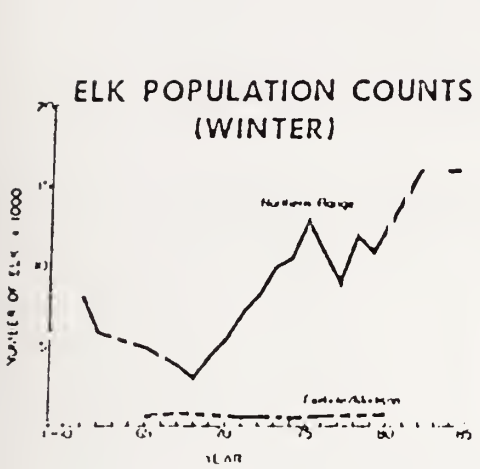
Figure 12. Garbage availability in Yellowstone National Park open-pit dumps. Inset shows garbage availability since 1910.

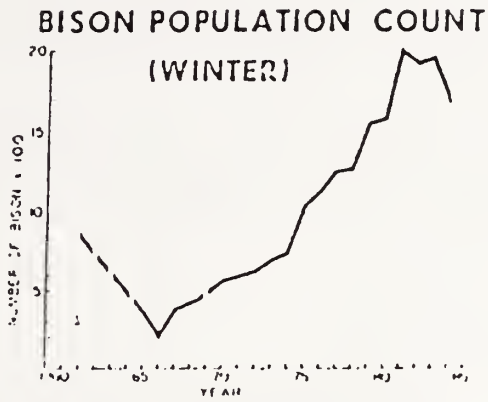
2. Elk numbers increased in the northern herd in the park from approximately 3000 in 1968 to approximately 16,000 in 1986 (Fig. 13).

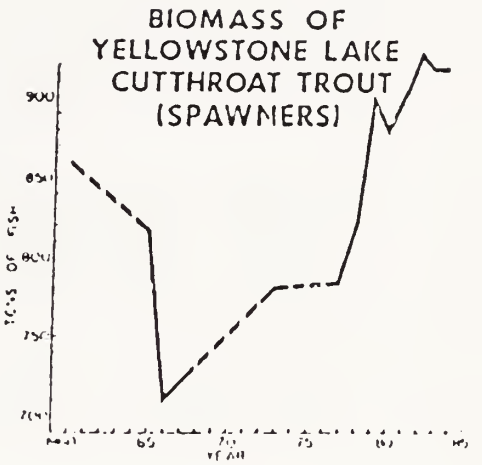
3. Bison numbers increased in the park from approximately 200 in 1966 to approximately 2,000 in 1986. (Fig. 14).

4. Yellowstone Lake cutthroat trout increased from approximately 710 tons of spawning fish entering streams around Yellowstone Lake in 1966 to approximately 920 tons in 1985 (Fig. 15). The

current estimate of spawning fish is 750,000 to 1.9 million each year.







Figures 13, 14, and 15. Relative changes in numbers of elk, bison, and Yellowstone Lake cutthroat in Yellowstone National Park since 1960.

5. In 1966 there were few older, larger spawning fish in the streams around the lake. Now there are several age classes of spawning fish. Older, larger fish spawn first and move farther up spawning streams while younger age classes spawn later and do not move as far upstream. This means that not only are there more fish in the streams now than in the 1960's but these fish are more widely distributed in the streams in space and time. This would be expected to influence more successful use of the spawning fish by bears.

6. Estimates of winter kill carrion from elk in Yellowstone Park are as follows:

Northern herd	262-327 tons/spring
Firehole herd	29-32 tons/spring
Total elk carrion	291-359 tons/spring

7. Estimates of winter kill carrion from bison in Yellowstone Park are as follows:

Pelican Valley herd	50-150 tons/spring
Mary Mountain herd	121-180 tons/spring
Larmar Valley herd	+/- 20 tons/spring
Total bison carrion	191-350 tons/spring

8. Winter killed ungulates from occupied habitat outside national parks in the Yellowstone Ecosystem are calculated by estimating the percentage lost of the wintering population. Such winter killed animals would normally become available as carrion in late winter and early spring. Winter kill estimates are made by the respective game and fish departments of each state. Weights for animals lost to winter kill were 350 pounds for elk, 400 pounds for moose, and 75 pounds for deer.

9. The elk winter kill losses on occupied grizzly bear habitat outside of Yellowstone National Park are as follows:

Wyoming.....	1976-85 x = 866	X 350lbs =	151.5 tons
Idaho.....	1985 20	X 350lbs =	3.5 tons
Montana.....	1985 254*	X 350lbs =	44.5 tons
Estimated elk carrion available due to winter kill outside Yellowstone National Park each spring			199.5 tons

* Montana figure calculated by assuming harvest equals 20% of total population. Harvest then subtracted from total population to yield the over-wintering population. Winter kill assumed to be 4% of overwintering population on average.

10. The moose winter kill losses in occupied grizzly bear habitat outside of Yellowstone National Park are as follows:

Wyoming.....	1976-85 x = 272	X 400lbs =	54 tons
Idaho.....	1985 = 30	X 400lbs =	6 tons
Montana.....	1985 = 61*	X 400lbs =	12 tons
Estimated moose carrion available each spring due to winter kill outside Yellowstone National Park			72 tons

* Montana figure calculated by assuming harvest equals 15% of the total population. Harvest then subtracted from the the total population to yield the overwintering population. Winter kill assumed to be 8% of the overwintering population on average.

11. The deer winter kill losses in occupied grizzly bear habitat outside of Yellowstone National Park are as follows:

Wyoming.....	1976-85 = 2994	X 75lbs =	112 tons
Idaho.....	no overwintering population		

Montana.....1984	= 3032*X 75lbs =	114 tons
Estimated Deer available each spring due to winter kill outside Yellowstone National Park		226 tons

* Montana figure calculated by using Wyoming winter kill percentages. Ten year average deer harvest in Wyoming equals 18% of prehunt population. Ten year winter kill average in Wyoming equaled 22% of prehunt population. Using hunter harvest of 2481 deer in 1984, prehunt population was calculated at 13,783 deer. Twenty-two percent of 13,783 equals 3032 winter kills.

12. Elk comprise the majority of winter-kill carrion available in late winter and early spring (Fig. 16).

13. Winter-kill carrion distribution in occupied grizzly bear habitat in the Yellowstone ecosystem is presented in Figure 17.

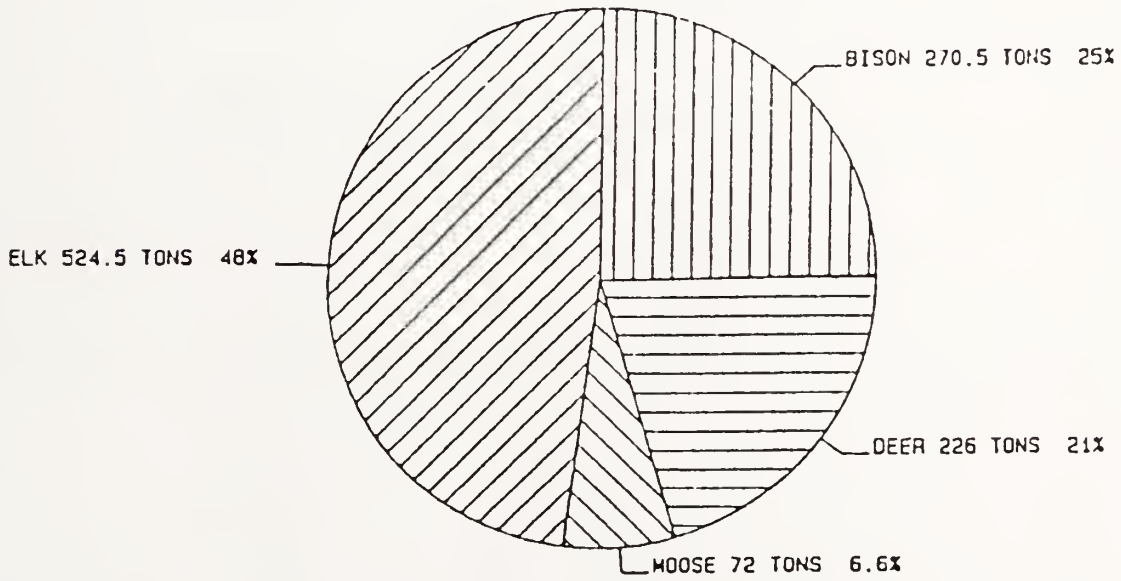


Figure 16. Total winter-kills available as late winter and early spring carrion in the Yellowstone ecosystem.

14. Preliminary data indicates that spring carrion use is influenced by distance to areas used by humans (Fig. 18).

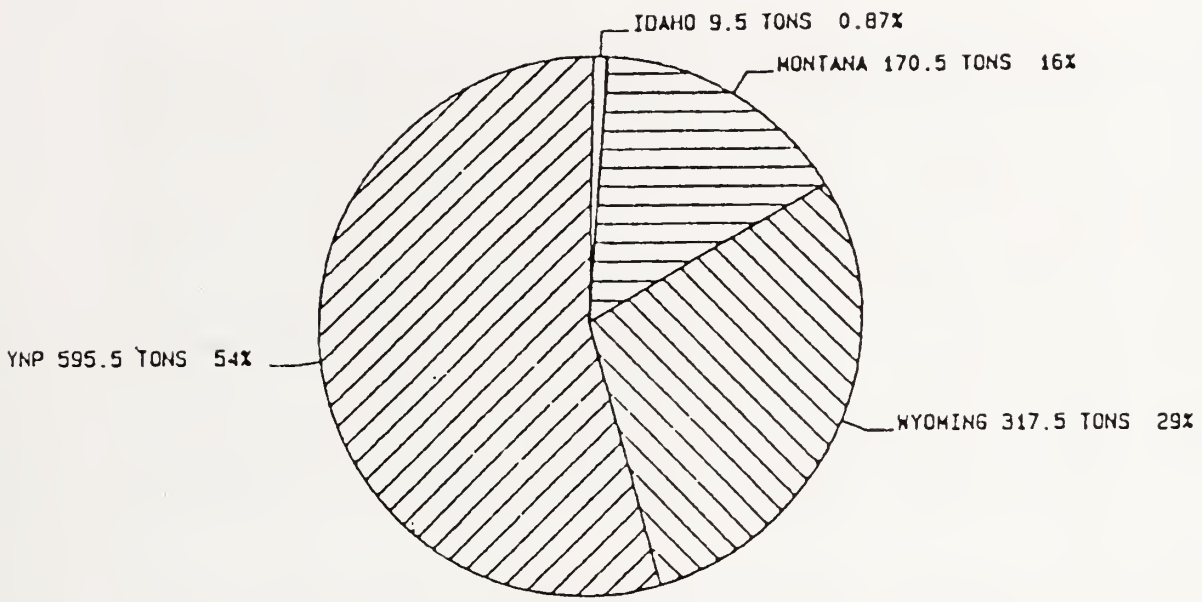


Figure 17. Distribution of winter kill carrion by area in the Yellowstone ecosystem.

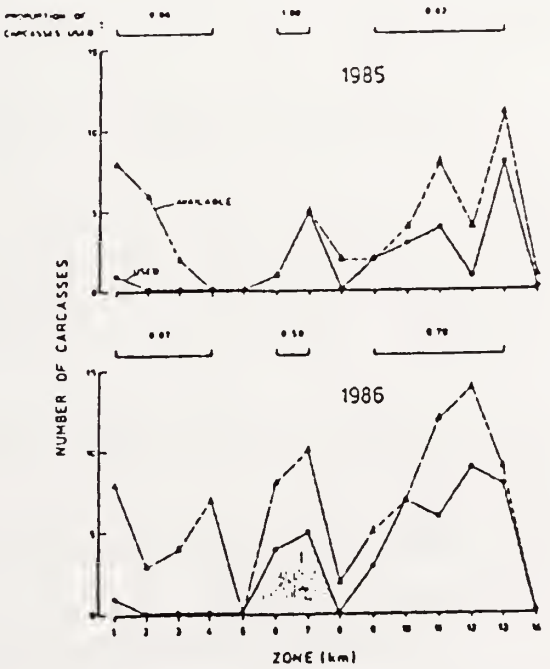


Figure 18. Number of carcasses used as a proportion of the number available by distance from the Old Faithful developed area from March to May 1985-86.

15. It is estimated that an average of 75 pounds of edible material remains as entrails, hide, bones, and waste after a hunter kills an elk or a moose. Twenty-five pounds of material is estimated to remain after a hunter kills a deer. Wounding loss is considered to be 5% of hunter harvest for elk and moose and 10% for deer. Whole animal weights used to estimate edible material from animals lost from wounding were 700 pounds for elk, 800 pounds for moose, and 100 pounds for deer. Figures presented in #10, #11, and #12 below originated in the respective game and fish departments of each state. They are annually calculated by hunting units. Since hunting unit boundaries do not follow occupied habitat boundaries precisely, the numbers are not exact as to the amount of food within occupied habitat but they are representative and as close to accurate as is possible given current information.

16. The elk harvest by sport hunters in occupied grizzly bear habitat outside Yellowstone National Park and its resultant contribution to food availability is as follows:

Wyoming sport harvest 1976-85 x = 4893 X 75lbs =	183 tons
Wyoming wounding loss 1976-85 x = 245 X 700lbs ea =	86 tons
Idaho sport harvest 1985 = 200 X 75lbs =	7.5 tons
Idaho wounding loss 1985 = 10 X 700lbs =	3.5 tons
Montana sport harvest 1985 = 1588 X 75lbs =	60 tons
Montana wounding loss 1985 = 80 X 700lbs =	28 tons
Estimated elk remains available due to sport hunting each fall	368 tons

17. The moose harvest by sport hunters in occupied grizzly bear habitat outside Yellowstone National Park and its resultant contribution to food availability is as follows:

Wyoming sport harvest 1976-85 x = 483 X 75lbs =	18 tons
Wyoming wounding loss 1976-85 x = 24 X 800lbs =	9.6 tons
Idaho sport harvest 1985 = 30 X 75lbs =	1 ton
Idaho wounding loss 1985 = 1.5 X 800 =	0.6 ton
Montana sport harvest 1985 = 135 X 75lbs =	5 tons
Montana wounding loss 1985 = 7 X 800lbs =	2.8 tons
Estimated moose remains available due to sport hunting each fall	37 tons

18. The deer harvest by sport hunters in occupied grizzly bear habitat outside Yellowstone National Park and its resultant

contribution to food availability is as follows:

Wyoming sport harvest 1976-85 x = 2421 X 25lbs =	30 tons
Wyoming wounding loss 1976-85 x = 246 X 100lbs =	12 tons
Idaho sport harvest 1985 300 X 25lbs =	3.8 tons
Idaho wounding loss 1985 30 X 100lbs =	1.5 tons
Montana hunter harvest 1984 = 2481 X 25lbs =	31 tons
Montana wounding loss 1984 = 248 X 100lbs =	12.4 tons
Estimate deer remains available due to sport hunting each fall	90.7 tons

19. Elk contribute the majority of sport hunt related carrion in the Yellowstone Ecosystem (Fig. 19).

20. The majority of sport hunt related carrion in the autumn is available outside National Parks in Wyoming and Montana (Fig. 20).

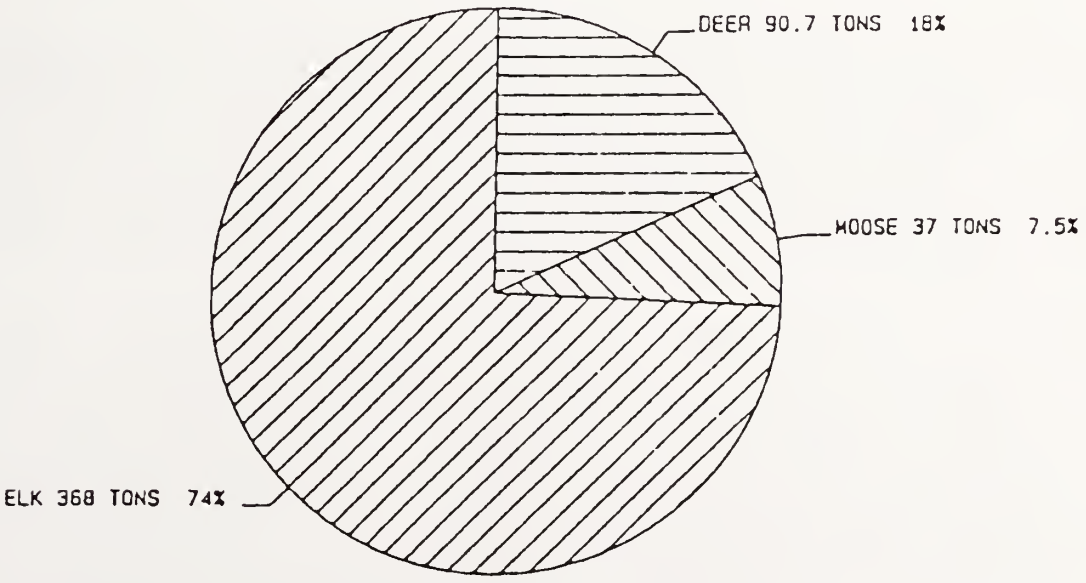


Figure 19. Total sport hunt related carrion available in autumn in the Yellowstone ecosystem.

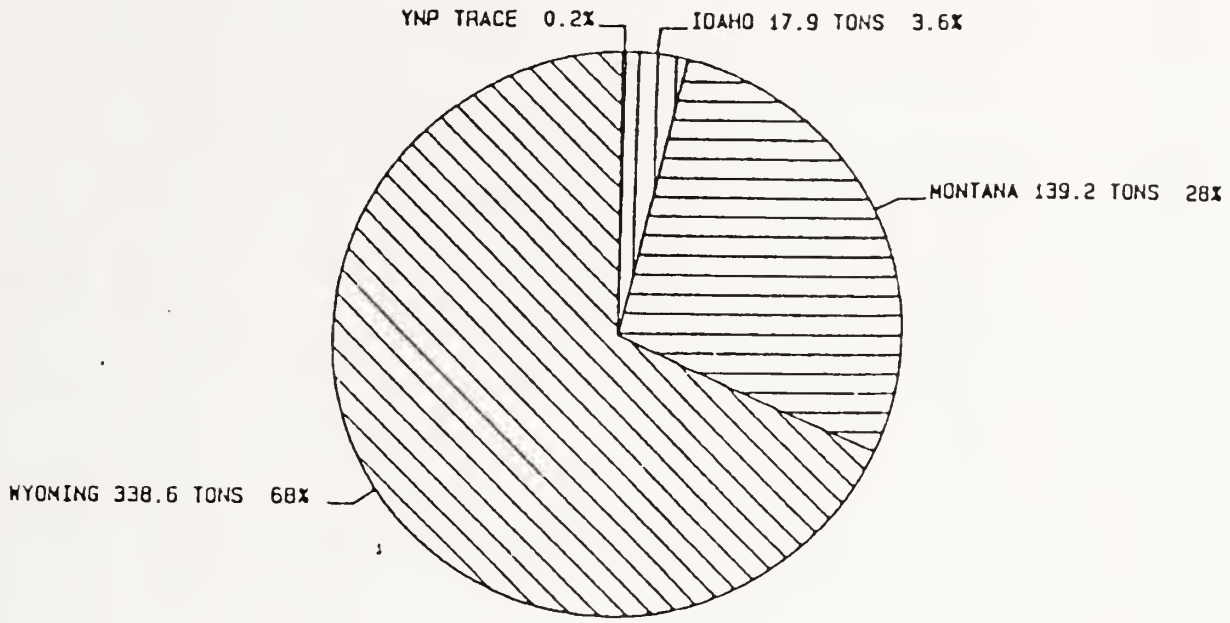


Figure 20. Distribution of sport hunt related carrion available in the autumn in the Yellowstone ecosystem.

CONCLUSIONS

At this time considerable data exist on the general ecology and movements of the Yellowstone ecosystem grizzly population. The food habits of the population are detailed to a high degree. The major foods include whitebark pine nuts and carrion. The trend in the availability of major foods in the ecosystem has been increasing since the late 1960's for ungulate carrion and fish and this increase occurred during the same time period when garbage became unavailable (Fig. 21). The trend in whitebark pine nuts is unknown.

The major high quality foods are also those whose availability is annually variable. Variability in carrion is a function of winter weather combined with ungulate population levels. Whitebark pine nuts vary in abundance due to weather and other factors and this variation is not fully predictable. Management actions that could effect whitebark pine variation perhaps exist on a long-term time scale. Fish availability in the streams around Yellowstone lake appears to be relatively stable to increasing. There is evidence that predation on elk calves is increasing and this may be due in part to the increase in elk populations resulting in a greater opportunity for predation.

Whitebark pine nut availability is an important factor in the late

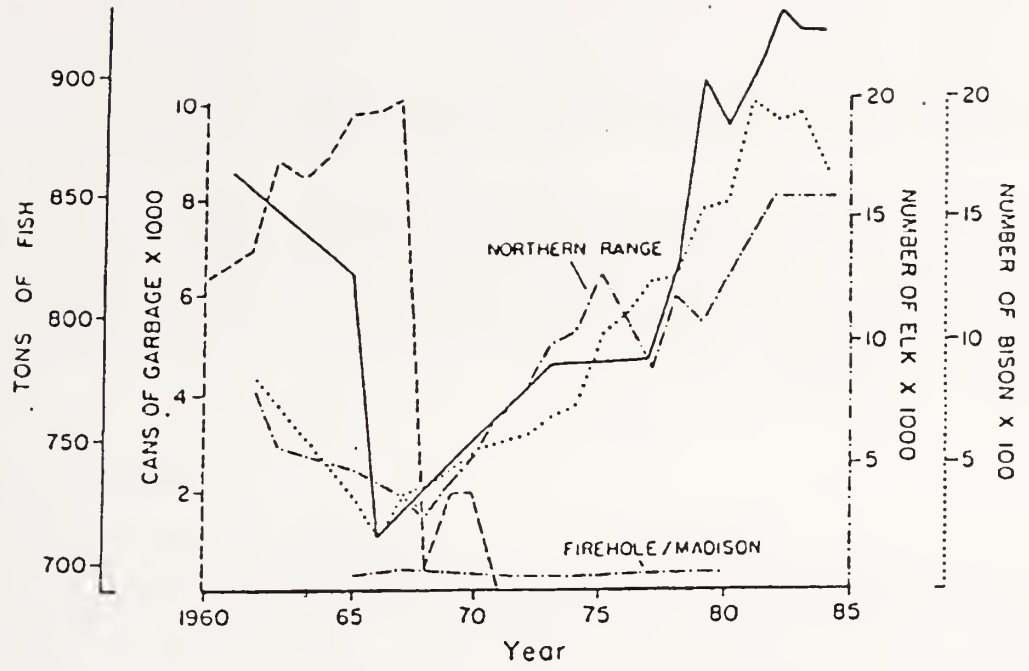


Figure 21. The relationship between elk, bison and cutthroat trout populations and garbage in Yellowstone National Park, 1960-1985.

summer/early fall diet. This coincides with the period of hyperphagia and of reduced availability of other high quality foods. The fact that Yellowstone ecosystem grizzly bears can and do switch to other foods when whitebark pine nuts are unavailable is known. What is not completely understood is the relationship between the use of alternate foods during years of low pinenut availability and possible reproductive and survivorship effects resulting from the quality and distribution of alternate foods during these periods.

The estimates of carrion availability in the Yellowstone ecosystem indicate the widespread distribution of this important food both inside and outside the Park during spring and autumn. The contribution of sport hunting seasons outside the Park to the availability of carrion has never been fully appreciated. This hunting-related carrion no doubt influences bear movements and distribution in non-Park areas during this time of the year. The estimates of carrion availability both inside and outside Yellowstone National Park are not meant to precisely detail the amount of this high quality food available to bears. These estimates are included to demonstrate the possible sources and distribution of carrion in the ecosystem. While it is recognized that bears do not have all this carrion available to them nor do they consume all of the proportion available to them, these estimates do demonstrate the fact that substantial amounts of high quality carrion exist in

the Yellowstone ecosystem, probably more so than in any other grizzly bear ecosystem in the conterminous United States.

The available data on grizzly bear foods and the population in the Yellowstone area indicate that sufficient foods are available to maintain a viable population in this ecosystem. Since 1975 no indications of malnourished grizzly bears have been found anywhere in the Yellowstone ecosystem. Thus, concerns about the need to artificially feed grizzly bears are not supported by the available data.

RECOMMENDATIONS

In order to better quantify the relationship between food availability and reproductive and survival effects, better knowledge about the survivorship and reproductive rates of the Yellowstone population is necessary. The source of these data have been and will continue to be monitoring the fate of particular animals, especially adult females, with telemetry. A better understanding of food availability changes will result from continued detailed studies of grizzly habitat and the energetic quality of foods used by grizzly bears. This information will also aid in the assessing the basis for annual distributional changes related to food and the reproductive, survivorship, and human conflict consequences expected from changes in the use and distribution of various foods.

Additional information on whitebark pine nut availability and distribution is also necessary. This high quality food is apparently the most variable as well as being important during several seasons. Management techniques to maintain and improve its distribution and productivity should be explored.

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11/30/86

Man-Caused Grizzly Bear Mortalities 1986

Northern Continental Divide Ecosystem (NCDE)

(The allowable man-caused mortality quotas for 1986 in the NCDE were 14 total of which no more than 6 could be female.

Non-Hunting

Management Area	Sex	Age	Date Taken	Location	Cause of Death
Mission	F	2-3	March-April(?)	Post Cr.	Illegal
Mission	F	2-3	March-April(?)	Post Cr.	Illegal
E. Front	F	2.5	May 9	Harold Yeager Ranch	Control sent to zoo
Glacier Park[1]	M	?	May	Many Glacier Hotel	Handling Death
E. Front	F	3.5-4.5	Spring 86(?)	Collar found in Two Medicine River	Illegal
Flathead[2]	M	3.5	June(?)	Bear Cr.	Unreported Mortality
E. Front	M	7.5	June 3	Badger-Two Medicine Area	Handling Death
E. Front	M	5	Oct. 11-12	Blackleaf Game Range	Illegal(?)
Flathead	M(?)	1/2(?)	Nov.	Java	Hit by train

Hunting (Oct. 1 – Oct. 11)

Flathead	M	(?)	Oct. 1	S. Fk. Flathead	Hunter
Flathead	M	(?)	Oct. 2	Great Bear Wild.	Hunter
Flathead	F	(?)	Oct. 4	Mid. Fk. Flthd.	Hunter
Flathead	F	(?)	Oct. 8	Mid. Fk. Flthd.	Hunter
Flathead	M	(?)	Oct. 10	Mid. Fk. Flthd.	Hunter

Also - 1 natural ♂ [redacted]

The 1986 grizzly bear hunting season opened on October 1 and ran through 1/2 hour after sunset on October 11.

Summary

Quotas: 14 total 6 female
Actual Kill: 12 total 6 female

[1]Quotas for known man-caused mortality have been established only for the bears outside of Glacier National Park. Therefore, mortalities of bears within the park do not count against established quotas.

[2]This bear had been captured and relocated during 1985. The collar was picked up in June 1986 and had been cut off the bear. No carcass was located and there are no leads at this time, but it appears the bear was taken during spring (possibly late May) as the signal was static for some weeks before the biologist investigated. Because this mortality would not have been documented if the bear had not been radio collared, it is classed as an unreported mortality (we estimate that there are seven of these per year in the NCDE). For further information see the Department EIS. Because these are already taken into account when establishing allowable quotas, the mortality does not count against the known mortality quota established for 1986.

Yellowstone Ecosystem

Bear	Sex	Age	Date	Location	Cause
KNOWN:					
121	M	6	July	Gravelly Mtns, MT	Mngt control; sheep depredation
76	F	6	9-6	Bear Cr., MT S of Bozeman	Defense of life
G28	M	cub	9-6	Bear Cr., MT	Defense of life (sent to zoo)
G29	M	cub	9-6	Bear Cr., MT	Defense of life
Unm.	M	3-4?	9-25	Wolverine Cr., MT	Illegal; mistaken for black bear
Unm.	F	2?	9-27	Wapiti Cr., MT	Illegal(?) hunter, defense of property
59	F	8	10-7	Canyon, YNP	Mgt control; human fatality
127	M	1	10-20	Lake, YNP	Mgt control, to zoo

If anyone has any corrections or additions to the list, please contact Arnold Dood (406) 994-6433 as soon as possible.

→ also 2 cubs natural